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16. Abstract (MAXIMUM 200 WORDS)

A technology demonstration effort was undertaken to determine if a remote imaging system could be used to reduce workload at a U.S. Coast Guard Small Boat (Surf) Station. The remote imaging system consisted of a black and white Closed Circuit Television (CCTV) system with integrated image intensification and long-range thermal (infrared) imaging. The goal was to determine the extent to which remote monitoring of rough inlet bar conditions and vessel traffic could reduce the need to staff a watch tower.

The demonstration project was conducted at U.S. Coast Guard Station Cape Disappointment in Ilwaco, WA. The remote imaging system was controllable both locally at the watch tower site and remotely from the Station's Communications Center. The cameras were mounted on a remotely controllable pan/tilt unit to allow the observer to determine the area of interest. The full motion video signal and all control signals were transmitted back and forth from the watch tower and the Communications Center via fiber-optic cabling.

Comparisons were made of the fidelity of the remote imaging system's capabilities to that of traditional monitoring techniques. An operational assessment was made on the impact the remote imaging system had on the operations of the Station. The evaluations identified that the remote imaging system with the long-range infrared camera improved monitoring during adverse weather conditions and darkness. The remote imaging system provided more accurate and timely information to the Station's Duty Officer, thus allowing additional decision-making time regarding resource assignments.

Recommendations on remote imaging system requirements and cost estimates are provided to aid in implementation decision making for the Office of Boat Forces (G-OCS).

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EXECUTIVE SUMMARY

The United States Coast Guard (USCG) Small Boat (Surf) Stations are required to monitor the environmental conditions, and vessel traffic, set restrictions when required, and conduct operations over inlet bars within their Area of Responsibility (AOR). The environmental monitoring, although a collateral/secondary duty, is critical to operational success and consists of monitoring weather and the conditions of the inlet (waves, tide, visibility, and other potential restrictive conditions to the safe passage of vessels). This monitoring is currently done by visual observation from an appropriate location on shore or by getting underway in one of the station's small boats. Several Surf Stations have a watch tower located at a convenient location to observe the inlet. These towers are usually located within a mile of the Station. This requires Station personnel to travel to the tower to make observations. Monitoring occurs at a minimum of twice a day (first and last light), as often as every four hours, and more continuously during adverse conditions or times of high vessel activity. The visual observations are limited primarily to daylight hours.

The conditions of the inlet can change in a short period of time due to weather and/or tides. Weather and tides can induce extremely hazardous, steep or breaking wave conditions at the inlets. The observations of these conditions are used to make critical resource decisions for operational assignments or to restrict vessel traffic over the bar. The demands of the conditions monitoring are a continuous drain on Station workload.

The USCG Research & Development Center undertook this project to determine if there are technology-based solutions to the problem. This work was performed in partnership with the Command and Control Engineering Center (C2CEN) for the Office of Boat Forces (G-OCS) of U.S. Coast Guard Headquarters. This project is being performed to support the efforts of Project Kimball.

After a review of numerous Surf Stations and available technology, a remote imaging solution for inlet bar observation was selected to be tested at USCG Station Cape Disappointment, in Ilwaco, WA. The remote imaging system consisted of: 1) a remotely controlled visual camera (closed circuit television (CCTV)) that was controllable both at the

tower and remotely from the Station's Communication Center, 2) a low light image intensifier integrated with the visual camera for providing night vision capabilities, and 3) a long-range thermal imaging camera mounted adjacent to the visual camera to evaluate infrared thermal imaging for both low light and low visibility conditions.

A series of fidelity tests where conducted to assess the remote imaging system's capabilities against that of the Station's current monitoring methods. Viewers using the remote imaging system in the Station's Communication Center were able to estimate wave height as well as an observer physically located in the watch tower. The remote imaging system also increased the ability to monitor the bar beyond daylight hours. The Station now has the ability to monitor the bar 24 hours a day, weather permitting, with the use of the infrared camera. The infrared camera provided some improvement in low visibility conditions (fog, sea spray off breaking waves, etc.), but it was not capable of seeing through all conditions, especially heavy fog. The image intensification capability in the remote imaging system did not provide sufficient performance gains to warrant being recommended as part of a final remote imaging system solution.

An operational performance evaluation of the system's impact on the Station was performed. It was found that the remote imaging system allowed the Station to reduce the amount of time personnel are needed for monitoring from the watch tower. After some hesitancy in trusting the information the remote imaging system provided, confidence with the remote imaging system built and the Station personnel began to use and rely on it. While not completely eliminating the need for tower watch monitoring, the remote imaging system will allow reduced tower manning as weather and conditions permit. The remote imaging system may allow the Station to change its Standard Operating Procedure which requires that first light bar condition monitoring be performed from a Motor Life Boat (MLB). This could result in fuel and workload savings.

The remote imaging system also has allowed the Station's Officer of the Day (OOD) to make better decisions by having more information available or having the same information in a faster timeframe. There is no longer a need to wait for a watchstander to arrive at the tower site before providing the decision maker with this vital information.

A remote imaging system should be installed at all twenty-six Surf Stations to reduce workload. The remote imaging system should consist of a remotely controlled visual camera and long-range infrared camera on a common pan/tilt unit. The remote imaging system should have local control at tower sites to provide the additional imaging capability when manned.